
An Epidemiologic Investigation of a Rubella Outbreak Among the Amish of Northeastern Ohio

BENITA M. JACKSON, MD, MPH
TONY PAYTON, BS
GEORGE HORST, MD, MPH
THOMAS J. HALPIN, MD, MPH
B. KIM MORTENSEN, PhD

At the time of the study, Dr. Jackson was an Epidemiologic Intelligence Officer, Division of Field Epidemiology, Centers for Disease Control and Prevention, assigned to Ohio Department of Health. Currently she is Clinical Assistant Professor of General Internal Medicine, Ohio State University, Columbus. Mr. Payton, Dr. Horst, Dr. Halpin, and Dr. Mortensen are all with the Bureau of Preventive Medicine, Ohio Department of Health.

Tearsheet requests to Dr. Jackson, 456 W. 10th St., Room 4510, Columbus, OH 43210; tel. 614-293-8179.

Synopsis

From April 1990 to April 1991, 278 cases of rubella were reported to the Ohio Department of Health. Of these, 276 (99 percent) were among the Amish of northeastern Ohio. The outbreak involved eight counties in an area that contains large settlements of Old Order Amish.

Members of this community of Amish frequently take religious exemption from recommended immunization practices and are believed to represent a high proportion of Ohio's rubella-susceptible persons. Vaccination history was known only for 146 of the Amish people. Of those, only four had a positive history of rubella vaccination.

Of the 276 Amish with cases of rubella, 65 (24 percent) were younger than age 5 years, 104 (38 percent) were ages 5-14, 46 (17 percent) were ages 15-19, 32 (12 percent) were ages 20-29, 6 (2 percent) were ages 30 or older, and age was not reported for 23 (8 percent). The ratio of males to females with rubella was 1:1.

Five women of the Amish community were pregnant; four had been ill with symptoms consistent with rubella. Three were in their first trimester. Congenital rubella syndrome did not occur in any of the four live births.

Serology was available for only the two non-Amish people, and both were acute phase serum-positive for Immunoglobulin M.

THE PEOPLE OF THE AMISH sect are direct descendants of the 16th century Swiss Anabaptists who migrated to the United States in the early 1700s to escape religious persecution. Although the first Amish settlements in the United States were in Pennsylvania, presently many of the largest settlements are located in the State of Ohio. The diverse Amish population in eastern Holmes County, Ohio, is estimated to be greater than 10,000, representing one-third of the total county population and one of the largest Amish settlements in the United States (1). The Amish people have large families, with an average of seven live births per family (2) and have multiple social interactions within their communities, churches, and schools (3).

The Old Order Amish (hereinafter referred to as the Amish) still believe in the tenets of the Swiss Brethren and separate themselves from the world by group solidarity and repudiation of modern

conveniences. Worldliness is to be avoided. For the Amish, this usually includes immunizations and blood transfusions that would interfere in outcomes that they believe to be demonstrations of Divine Providence.

The Amish Church does not have any rules against immunization. However, many families claim religious exemption for school entry immunization (4). Certain groups of the Amish reject the practice of immunizing children against disease. A survey of 100 Amish families in Pennsylvania revealed that only 26 percent of children had been vaccinated against diphtheria, pertussis, and tetanus, 23 percent against poliomyelitis, and 16 percent against mumps and measles (2).

The Outbreak

On August 6, 1990, the Immunization Branch of the Ohio Department of Health (ODH) investigated

reports of increases in the number of rubella cases among the Amish community. Immunization program directors in Tennessee and New York were queried regarding recent outbreaks of rubella among Amish in those States who had traveled within Ohio during the spring of 1990. A total of 85 probable cases of rubella were reported to the Northeast Ohio regional immunization representative by program directors in these other States. The cases had occurred since the funeral of a well known Amish patriarch, held in May 1990, that had been attended by Amish from Minnesota, New York, Pennsylvania, and Tennessee.

In April 1990, the first apparent case of rubella in the Ohio Amish community occurred in a woman who had been hospitalized for treatment unrelated to rubella. During the course of her hospital stay, a social worker from the admitting department of the hospital also was diagnosed with serologically confirmed rubella. Both women experienced rash illness within 24 hours of each other, implicating a common but unknown source. No other cases of rubella were reported in the non-Amish residents of that community.

A local investigation, conducted by a county public health nurse, turned up a line listing of 128 Amish residents with illness clinically diagnosed as rubella between April 4 and July 30, 1990. There were 8 cases in April, 40 cases in May, 55 cases in June, and 25 cases in July that occurred in this population. Reports of rubella among the Amish were received through the remainder of 1990 and into early 1991.

Methods

In our investigation involving an unvaccinated rubella-susceptible community, reporting was provisional. A case of rubella was defined as any Amish person who reported between April 1, 1990, and April 30, 1991, either the acute onset of generalized maculopapular rash illness or any of the following: (a) temperature higher than 37.2 degrees centigrade (if measured), (b) arthralgia-arthritis, (c) lymphadenopathy, or (d) conjunctivitis when other family members or close contacts were experiencing rash illness or both.

A field investigation was initiated that consisted of a series of informal surveys of local Amish religious leaders, county health officers, practitioners who were known to treat Amish patients on a regular basis, and families identified by others in the community to have had the "3-day measles." Special vaccination clinic services were offered to

Figure 1. Cases of rubella in Ohio Amish communities by date of rash onset, April 1990–April 1991

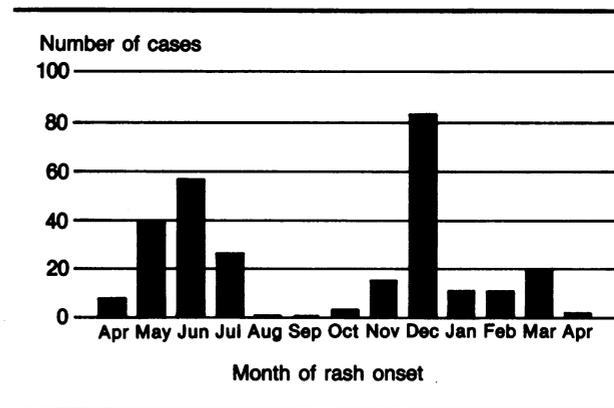
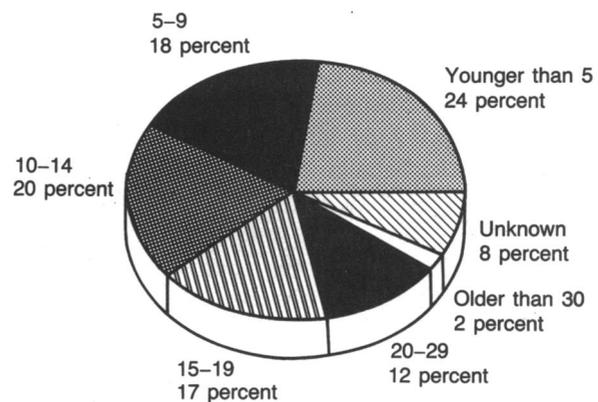


Figure 2. Distribution of rubella by the age groups (years) among Amish in Ohio, April 1990–April 1991



the Amish at no charge. In an effort to notify the Amish community of the outbreak, the nature of the disease and the risk of congenital rubella syndrome were described in an article published during the summer of 1990 in a widely distributed Amish newspaper, the Budget.

Results

From April 1, 1990, to April 30, 1991, a total of 278 cases of rubella were reported to the Ohio Department of Health. Of these, 276 were Amish residents. The outbreak involved eight counties in northeastern Ohio, with the largest number of reports from Medina County. The 2 peak months of rash onset were June and December 1990 (fig. 1). The sex ratio was 1:1 with 138 males and 138 females affected. The mean age was 10.9 years, with a range of 1 month to 40 years. Of the 276

'The threat of CRS remains greatest among religious groups like the Amish. Increased surveillance for adverse birth outcomes consistent with CRS is a challenge, because many births to Amish women occur at home and are not observed and reported.'

people with rubella, 65 (24 percent) were younger than age 5 years, 104 (38 percent) were ages 5-14, 46 (17 percent) were ages 15-19, 32 (12 percent) were ages 20-29, 6 (2 percent) were age 30 or older, and 23 (8 percent) did not report age (fig. 2).

Vaccination history was known only for 146 residents of the Amish community; 4 had a positive history of vaccination, and 142 denied receiving vaccination. Serology was available only for the 2 non-Amish cases, and both persons were positive for Immunoglobulin M.

Five Amish women were pregnant during the outbreak, and four had been ill with symptoms consistent with rubella. No further information was available on the fifth who had miscarried. Of those symptomatic during the outbreak, three were in their first trimester. Of the four term pregnancies, none have resulted in the congenital rubella syndrome to date.

To ascertain whether the spread from the Amish population to the non-Amish population had occurred at the time of the initial outbreak, a review was made of possible meeting and marketing places. An informal telephone survey of physicians who treat Amish and non-Amish patients in Medina, Wayne, and Holmes Counties did not identify additional non-Amish cases. Although satellite clinics offered free vaccinations to Amish people at the time of the initial outbreak, fewer than five doses of vaccine were requested and administered.

Discussion

Since 1966, rubella has been a notifiable disease nationally. Rubella vaccine has been licensed since 1969, when the United States began to attempt universal vaccination to control rubella in preschool and school-aged children, reducing and interrupting the circulation of the virus and the risk of exposure to susceptible pregnant women (5).

Rubella reports in the 1989 and 1990 National Notifiable Disease Surveillance System (NNDSS) of

the Centers for Disease Control and Prevention (CDC) showed that a greater proportion of cases occurred among persons ages 1-14 years. This reflects the contribution of outbreaks in religious communities among unvaccinated children. In the 1990 outbreak among the Amish in Ohio, provisional reporting of rubella to the NNDSS increased to 1,093 (0.4 cases per 100,000 population), the highest total since 1982. Twenty-six of the rubella outbreaks that occurred in 1990 were in two settings: (a) where unvaccinated adults congregate in such locations as prisons, colleges, workplaces) and (b) in religious communities with low levels of rubella vaccination coverage (6).

In the spring of 1990, barn raisings in the Amish area of Ohio may have played a major role in spread of the disease. A total of nine barn raisings occurred from April to September 1990, and each had one or more infectious people attending. Church gatherings, weddings, and funerals throughout the Amish community presented additional opportunities for disease transmission. These events were attended by many Amish people from Canada and from other States, including Minnesota, Tennessee, Iowa, and New York.

The two peaks in rubella spread most likely represent times of greatest social interaction and activity within the Amish community. The first peak can be attributed to the busy social schedule of barn raisings. The cause of the second peak is unknown. The first peak involves three neighboring counties with the largest Amish settlements and included case reports from April to October 1990. The second peak included reports from counties south of the original three counties and ended with more distant counties in the upper northeast corner of the State.

Of interest is the fact that the rubella cases were almost exclusively in the Ohio Amish community during this outbreak. Amish children attend Amish schools and are segregated from non-Amish school children. Non-Amish children have much higher rates of immunization. Among non-Amish children in Ohio, vaccination coverage against rubella is estimated to be 77.3 percent for preschool children, 98 percent for kindergarten children, and 99 percent for children in grades 1-12, according to CDC's unpublished data from its annual immunization survey of Ohio.

The most important consequence of rubella is congenital rubella syndrome (CRS) that produces a variety of defects in infants born to women infected during their pregnancy. Rubella can also produce intrauterine infection in pregnant women

that can result in abortions, miscarriages, and stillbirths. The risk of CRS is greatest in the first trimester of pregnancy, with defects rarely resulting from infection after the 20th week. Fetal infection without clinical stigmata of CRS can occur at any stage of pregnancy. The main goal of rubella immunization programs is to prevent fetal infection and CRS (7).

The threat of CRS remains greatest among religious groups like the Amish. Increased surveillance for adverse birth outcomes consistent with CRS is a challenge, because many births to Amish women occur at home and are not observed and reported. Cord-blood samples for rubella titers would provide additional epidemiologic information and again are not likely to be available from this population. Health care providers who are trusted by this community are encouraged to improve levels of rubella vaccine coverage among children and adults, particularly women of child-

bearing age, perhaps by identifying missed or underused opportunities for vaccination.

References

1. Levinson, P. M., et al.: Behavioral risk factors in an Amish community. *Am J Prev Med* 5: 150-156 (1989).
2. Adams, C. E.: and Leaverland, M. B.: The effects of religious beliefs on the health care practices of the Amish. *Nurse Pract* 11: 58-60 (1986).
3. Hostetler, J. A.: Amish society. Ed 2. Johns Hopkins University Press, Baltimore, 1980.
4. Sutter, R. W., et al.: Measles among the Amish: comparative study of measles severity in primary and secondary cases in households. *J Infect Dis* 163: 12-16 (1991).
5. Rubella and congenital rubella surveillance, 1983. *MWWR Morb Mortal Wkly Rep* 33: 237-242, 247, May 11, 1984.
6. Increase in rubella and congenital rubella syndrome—United States, 1988-1990. *MWWR Morb Mortal Wkly Rep* 40: 93-99, Feb. 15, 1991.
7. Rubella and congenital rubella syndrome—United States, 1985-1988. *MMWR Morb Mortal Wkly Rep* 38: 173-178, Mar. 24, 1989.

Pneumococcal Vaccination in a Remote Population of High-Risk Alaska Natives

MICHAEL DAVIDSON, MD, MPH
CAROL CHAMBLEE, RN, MPH
HENRY G. CAMPBELL, RN, MPH,
LISA R. BULKOW, MS
GRADY E. TAYLOR
ANNE P. LANIER, MD, MPH
JAMES BERNER, MD
JOHN S. SPIKA, MD
WALTER W. WILLIAMS, MD, MPH
JOHN P. MIDDAGH, MD

Five authors are with the Public Health Service's Centers for Disease Control and Prevention (CDC). Dr. Davidson, Ms. Bulkow, and Mr. Taylor are with the National Center for Infectious Diseases, Arctic Investigations Program. Dr. Spika is with the National Center for Infectious Diseases, Division of Bacterial Diseases. Dr. Williams is with the National Center for Prevention Services, Division of Immunization. Miss Chamblee, Mr. Campbell, Dr. Lanier, and Dr. Berner are with the Public Health Service's Indian Health Service, Alaska Area Native Health Service. Dr. Middaugh is with the State of Alaska, Department of Health and Social Services, Division of Public Health, Section of Epidemiology.

Tearsheet requests to Michael Davidson, MD; Alaska Native Medical Center, Department of Medicine, 255 Gamble St., Anchorage, AL 99501; tel.: (907) 279-6661; fax.: (907) 257-1115.

Synopsis

In response to an increasing prevalence of serious pneumococcal disease among adult Alaska Natives of northwest Alaska, a 3-year program was begun in 1987 to identify residents of that remote region who were at high risk for developing invasive pneumococcal disease, to determine their pneumococcal vaccination status, and to deliver vaccine to at least 80 percent of those at risk.

After reviewing public health nursing and Indian Health Service data bases, the authors identified 1,337 persons, 20 percent of the 6,692 residents of the region, at high risk for invasive pneumococcal infection, defined either by having a specific chronic disease or by age criteria. Cardiovascular disease and alcoholism were the two most common chronic diseases. Only 30 percent of those determined to be at high risk had received one or more doses of pneumococcal vaccine previously. Half of those persons had received their most recent vaccination 6 or more years earlier.

The program used both customary and innovative methods to deliver 23-valent polysaccharide